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For

TRANSACTIONS USING A DYNAMIC INTERFACE CARD WITH AUTOMATIC SENSING

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TRANSACTIONS USING A DYNAMIC INTERFACE CARD WITH AUTOMATIC SENSING

FIELD OF THE INVENTION

[0001] The present invention relates generally to transferring electronic transaction data for conducting transactions and more particularly to transferring electronic transaction data from a card by automatically sensing a reader device.

BACKGROUND

[0002] Technology is rapidly progressing to permit information to be stored conveniently on portable instruments, such as transaction cards, to facilitate a variety of non-cash transactions. However, many of the uses for such cards require a different magnetic transaction card for each type of transaction. These cards usually have a particular type of transaction data encoded into a single or multiple magnetic stripe(s). As a result, an individual may be required to carry numerous transaction cards, such as general use credit cards, e.g. Visa®, Mastercard®, American Express®, etc., mono-line cards (i.e. vendor-specific credit cards), automatic teller machine (ATM) cards, as well as cards for club memberships, discounts, point accumulations, insurance information, telephone calls, and many more types of transaction cards.

[0003] Multi-purpose transaction cards exist which carry much data required for the defined number of card functions. One category of card that permits a variety of card functions is referred to as a smart card. The typical smart card includes an embedded microprocessor, or the like, and uses processing circuitry for data storage and interacting

with a transaction data reader, such as an ATM or merchant terminal. Often, a keyboard or other control panel is provided on the face of the card to input data into the card.

[0004] However, these data-carrying multi-purpose cards create security risks if the card is lost or stolen. The cards usually contain sensitive information, such as a user's personal data and/or the codes required to access the personal data stored on an external database, such as a user's financial account. The convenient pocket size of these cards allows them to be easily forgotten at the point of sale during a transaction and the value of a card data is compromised until its misuse is discovered.

[0005] Although the card may utilize some security measures, e.g. password protection, the data may still be exposed to the risk of hackers, and others maliciously gaining access to the personal data. Moreover, the security mechanism that may be provided in smart card adds to already complicated and expensive components normally present in these cards.

[0006] In addition, smart cards generally consume much power during use. However, most smart cards continue to use power even when they are not in operation. Smart cards that do not include mechanisms to conserve power make extensive use of the cards impractical.

[0007] Efforts to create multi-purpose transaction cards have additionally been thwarted by the need for the card to be compatible with a growing number of different devices that read the card data. Most legacy systems read only magnetic formatted information that is traditionally provided on magnetic cards. Many smart cards require a special reader device to retrieve the transaction data from the card. In addition, these smart cards have

limited compatibility with existing and future smart card reading systems that have different operating systems for which the card was designed.

[0008] In general, the shortcomings of the currently available transaction cards include an inability to work with a variety of devices. Furthermore, previous transaction smart cards encompass complicated components, such as to protect the security of data, that increase the cost of the card and waste power.

SUMMARY

[0009] The present invention provides a method for performing a transaction, whereby a user-specific data for a transaction type is conveyed to a reader device through the use of an interface card. The interface card receives user-specific data that is transported from a data source or a personal data device. The interface card has at least one inductor that may sense when data is to be transferred to a reader device and, in response, the inductor is activated for the transfer. The interface card is presented to the reader device and electromagnetic signals from the reader device are detected be at least one sensing area of the interface card. A first sensing area may be placed within a distance from the reader device that allows this sensing area to detect reader device signals. Also, in some embodiments, the inductor may sense when the transfer has ended and, in response, be deactivated. A second sensing area may be placed within a distance from the reader device to permit this second sensing area to detect reader device signals. The process of transferring data may be include moving the card with regards to the reader device from the first to the second sensing areas. This and other described ways of turning the card on and off may preserve power on the card.

[0010] In one embodiment, the user-specific data is erased from the card. For example, after the second sensing area detects reader device signals, the card may be triggered to automatically erase the data. One method of erasing data is by removing power supplied to a memory unit on the card.

[0011] The inductor may take a variety of forms and be configured in various ways on the card and with respect to the card's data area. For example, the inductor includes a liquid or semi-liquid substance. Such substance may include ferrous-magnetic particles

dispersed throughout the medium. In addition, in some embodiments of interface card, the inductor induces power into a supply on the card.

[0012] In some embodiments of the transaction system that employs the interface card, the personal data device includes a portable telephone or personal digital assistant. Furthermore, the user-specific data may be selected from a plurality of user-specific data for more than one transaction type and only one transaction type of user-specific data is on the interface card at a time. This data may be selected from a set included in the personal data device. The first type of user-specific data may be erased from the card at any convenient time and a second type of user-specific data may be then transported onto the interface card.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The present invention is illustrated by way of example that is not intended for limitation, in the figures of the accompanying drawings, in which:

[0014] **Figures 1A** to **1F** illustrate various embodiments of an interface card, according to the present invention, wherein **Figure 1A** shows an inductor with a coil and core in a data area, **Figure 1B** shows a liquid or semi-liquid inductor, **Figure 1C** shows an inductor with an enfolded core and inductor located outside of the data area, **Figure 1D** shows an inductor with an enfolded core and inductor located in he data area, **Figure 1E** shows a horizontal gap core inductor and **Figure 1F** shows a vertical gap core inductor..

[0015] **Figure 2** shows a portion of an exemplary two-track interface card, according to the teachings presented herein.

[0016] **Figure 3** is a block diagram one embodiment of a transaction environment in which data may be passed onto an interface card by a personal data device for use with a reader device, in accordance with the teachings presented herein.

[0017] **Figure 4** illustrates one embodiment of a personal data device according to the present invention.

[0018] **Figures 5A** and **5B** illustrate an example of user-specific data, wherein **Figure 5A** represents one embodiment of data set and **Figure 5B** represents selected data from the data set.

[0019] **Figures 6A** to **6C** are flow charts depicting method for conducting a transaction with a user transaction system in varying detail, wherein **Figure 6A** shows one example of a method for conducting a transaction and **Figure 6B** shows one method for a personal

data device to pass data to an interface card, **Figure 6C** shows an example of a method for a transferring data from an interface card to a reader device.

DETAILED DESCRIPTION

[0020] A user transaction system is provided, which includes an interface card that serves as a conveyance medium for transfer of data from a personal data device to a reader device for use in exchanges with a transaction provider. The interface card has an inductor that may serve multiple functions within the card. For example, the inductor may sense when data is to be transferred to a reader device and, in response, the inductor is activated for the transfer. Also, in some embodiments, the inductor may sense when the transfer has ended and, in response, be deactivated. In this manner, power is preserved on the card. In addition, in some embodiments of interface card, another function of the inductor is to induce power into a supply on the card.

[0021] The interface card typically only has the data required for a specific transaction at any given time. Furthermore, in one embodiment, the interface card may only carry the data for the period of time that it takes to complete the exchange or shortly thereafter. The data may be conveniently erased from the card and available for new transaction data to be passed onto the card. Since data storage is temporary, the necessity of complicated security measures to be provided on the card may be avoided. In this manner of transferring transaction data, a simplistic and versatile card may be used as a data transfer vehicle.

[0022] The present transaction system may facilitate any transaction that requires user-specific data. Such user-specific data may identify a user or pertain to other information that is special to the user and relevant to a transaction, rather than being applicable to the general population not associated with the user. User-specific data relating to a particular transaction and passed to the interface card may be chosen from among a plurality of data

for various transactions. The user transaction system is highly flexible for operation with endless types of exchanges that utilize such user-specific data. For instance, the transaction may be related to a user's personal funds and involve access to a financial account from a remote terminal. This type of financial account transaction often involves personal funds data, such as credit card account numbers, expiration dates, bank account numbers and amounts available for release, as well as authorization codes associated with the accounts.

[0023] Some other transactions include telephone calls or Internet access, wherein the data may be a prepaid value amount, access code, and the like; membership management, wherein the data may be information for tracking of member activity, and the like; healthcare services, wherein the user-specific data may include health records, medical alerts (e.g., allergies), prescriptions, and the like; access control transactions, wherein the data may include an identification or authorization code; purchases at vending machines, wherein the data may be prepaid value, etc. These transactions and data types are listed by way of example. They are not intended to limit the transactions and type of user-specific data for which the transaction system may be applied, according to the present invention.

[0024] The interface card typically carries only one type of user-specific data at a time, rather than the card storing an aggregate of different types of data. The type of user-specific data on the card may be conveniently changed to a different type for a desired transaction.

[0025] The interface card, as illustrated by various embodiment in **Figures 1A to 1F**, is an article that carries data in an information-yielding arrangement. As shown in **Figure**

1A, the interface card **2** has a main body **4** with a data area **6** that includes the data tracks **8** and each having a multipurpose inductor **10** that communicates to a processor **30**. A data interface **38** is provided to obtain data, which is stored in memory unit **32**. A power unit **36** for the card is provided and a memory power supply **34** may also optionally be provided to communicate with the processor **30** and memory unit **32**. At least one visual indicator **38** is optionally provided to signify interface card operations to a user.

[0026] Optionally, various indicia may be also disposed on the card surface to serve a variety of purposes, for example, to label the visual indicator(s) or other card components, identify the card owner, identify transaction types that the card may be used for, identify the transaction system(s) that may employ the card, provide an esthetically appealing appearance, display a registration code for the card, etc.

[0027] The main body **4** of the card may be made of any convenient material, and usually a polymeric substrate, which may be optionally coated with a transparent layer such as silica or gelatin. The card may be any desired size and shape as long as at least a portion of the card has physical dimensions that are compatible with a reader device, e.g. able to be inserted into existing legacy magnetic reader devices. Often, the interface card is pocket size, e.g. from about 50.00 x 80.00 mm to 70.00 x 120.00 mm (usually about 53.98 x 85.60 mm) and between about 0.15 mm to 1.5 mm (usually about 0.76 mm) in thickness.

[0028] The data area **6** is oriented on the card in a location in which at least a portion of the inductor **10** that is in the data area is accessible by a reader device. The inductor may be any of a variety of material formats suitable to emit a magnetic field to provide signals that represent data. In one embodiment, the inductor **10** may be comprised of a coil **12**

wrapped around a core **14** and. The inductor may be any length that is appropriate to produce a magnetic field that may be read by a reader device and have a suitable number of coil windings, e.g. from a single winding to many hundred turns, to produce the desired magnetic flux density.

[0029] The inductor may be composed of any material that permits repetitive receipt and transfer of data thereto. Where the inductor comprises a coil, the coil may include a ferrous material, such as copper or iron-cobalt. The core may also include a ferrous material and typically iron.

[0030] In addition, alternative inductor forms may be used, e.g. a flat inductor with no coil windings. In another embodiment, as shown in **Figure 1B**, the inductor may be a liquid or semi-liquid substance, such as a ferro-magnetic fluidic substance. In one embodiment, ferro-magnetic fluid includes ferromagnetic particles **25** suspended within a conductive medium, e.g. viscous or gel substance. For example, the particles may be made to organize in a manner that represents the user-specific data and then optionally relax again to erase the data, e.g. after transfer to the reader device. The liquid-type suspension inductor may be contained within a confined area in the interface card, e.g. the data area **8**. The inductor may also be a combination of solid material, e.g. core, and liquid or semi-liquid material. The liquid (and semi-liquid) inductor version of the interface card may have similar other card components as described for **Figure 1A**.

[0031] In one embodiment, the entire inductor, e.g. coil and core are positioned in the data area. In embodiments, as shown in Figures **1C to 1F**, a portion of the inductor is located elsewhere on the card and another portion of the inductor is in the data area. For example, the entire coil, at least a portion of the coil or liquid particles may be located

away from the data area and the core or other wire lead may run from the coil or liquid particle to the data area to move data to the to the data area for transfer to the reader device. In **Figure 1C**, the core **14** enfolds partially around itself in the data area to form a gap **23** between itself and the coil **12** is located away from the data area **6**. The gap may be useful to strengthen the magnetic field, for example, where the coil is located away from the data area. In **Figure 1D**, the core **14** enfolds partially around itself in the data area to form a gap **23** between itself and the coil **12** is inside of the data area **6**. In **Figure 1E** a gap **23** is formed between horizontal opposing ends of the core **14** leading from the coil **12**. In **Figure 1F** the gap **23** is formed between vertical opposing ends of the core **14** running from the coil **12**.

[0032] The inductor may be coupled to various other components of the interface card to perform a variety of functions. The inductor **10** is in communication with the processor **30** in order to execute some of these tasks.

[0033] The processor **30**, such as a microprocessor, i.e. central processing unit (CPU) performs various central tasks, such as initializing components, waiting for a notification signal induced by the legacy reader device, fetching data and instructions from memory, and running various programs. The processor usually contains an arithmetic-logic unit, control unit and a clock to regulate processor speed and synchronize system components.

[0034] Usually, the processor **30** may activate, i.e. "turn-on", the inductor **10** to transfer the user-specific data. Activation of the inductor may be through the processor initiating a driver (not shown) or other similar component to supply data signals that represent the user-specific data, from the memory unit **32** to the inductor.

[0035] Activation may occur automatically upon the inductor receiving signals from the reader device as described in detail below. In another embodiment, the interface card is activated upon receiving the user-specific data, or a scheduled period of time thereafter. In one embodiment, the card is turned-on as soon as the user-specific data is received, such as from a personal data device. In this case, the data may be immediately converted to electromagnetic signals by the inductor for transfer to the reader device. Activation may occur by the external data source being prompted to begin supplying the inductor with data. The activation period may be scheduled to last for a defined period of time, e.g. 5 minutes, and thereafter the inductor is deactivated, i.e. "turned-off." Deactivation may also occur by the interface card sensing reader device signals signifying end of data transfer and optionally the user-specific data erased from the card, as described in detail below.

[0036] The user-specific data that is received by the interface card, e.g. from the personal data device, is temporarily stored in the memory unit **32**. The memory unit **32** may be any magnetic, optical, magneto-optical, tape, and/or other type of machine-readable medium or device for writing and storing user-specific data. The memory unit allows the user-specific data to be stored therein, the data to be removed from the memory unit, and other data to be subsequently received. For example, the memory unit **32** may be a writeable optical compact disc (e.g. CD ROM, DVD), a disc, tape, random access memory (RAM), such as dynamic RAM (DRAM) and static Ram (SRAM), etc. The size of memory unit **32** depends on the type and amount of data stored. The memory unit **32** stores only one type of user-specific transaction data at a time, such as for use in a single transaction.

Thus, the amount of storage in the memory unit is usually small. For example, typical user-specific data for a single credit card is about 2 Kbytes of data.

[0037] Transfer of user-specific data between the inductor and the reader device **50** may be in accordance with various standards. For example, the encoding technique may be in compliance with American National Standards Institute (ANSI), standard X4.16-1983 and international standard ISO/IEC 7811 Part 2. The user-specific data may also be stored in accordance standards promoted by other standards organizations, e.g. Infrared Data Association (irDA), HomeRF, Bluetooth, etc. The signals emitted from the inductor are usually in a form readable by general magnetic reader devices. The data may be represented by variations of the presence or absence of the field, such as no flux, to a flux line, and back to no flux. In one embodiment, the inductor receives serial data from the processor. In this case, the data area need not be moved, e.g. swiped, relative to the reading head of the reader device. However, the card may be moved in order to permit the inductor sensors to detect the reader device or in a manner consistent with methods that a user normally uses to transfer data from a card and which the user is comfortable. In another embodiment, the data is parallel and must be moved relative to the reading head for the reader device to appropriately gather all of the data on the data area.

[0038] In general, the inductor **10** writes data by varying a magnetic flux through a closed circuit to generate an electromotive force. The magnetic field oscillates or pulses as the reading head **54** of reader device **52** travels along the inductor to saturate the head and vary the direction of the magnetic field at the reading head. The result is a magnetic signal transferred to the reading head of the reader device that represents the user-specific data.

[0039] Another optional function of the inductor is to sense electromagnetic signals, e.g. small magnetic bias field signals, electromagnetic components associated with a gap in the reader head, a magnetic field due to reader device metal components or integrated reader device circuitry, etc., from a reader device and to notify the processor or other component to activate and/or deactivate the inductor. The inductor may have a first sensing area **16** that detects the signals released from the reader device to determine that the data is to begin to be transferred to the reader device. However, in other embodiments the first sensing area is component of the interface card that is separate from the inductor to transfer data, e.g. a separate sensing inductor. The first sensing area must be located on the card in a position that may detect signals from the reader device. In one embodiment, the first sensing area may be the first coil or beginning number of coils of the inductor. The first sensing area may also be a portion of a liquid suspension inductor that initially communicates with the reader device. Usually, the first sensing area is located at or near a first end **18** of the data area **6**, which is the portion of the interface card that is initially exposed to the reader device signals. As a result of this detecting of the reader device signals, e.g. by the first sensing area, the inductor **10** is activated to transfer the user-specific data.

[0040] In an embodiment of the interface card, the card has at least one sensing area, e.g. a second sensing area **20**, to sense the reader device's electromagnetic signals to determine that the transfer of data to the reader device has finished. The second sensing area sends a message to the processor or other card component when reader device signals are detected. The processor or other component, in turn, deactivates the inductor to stop transferring data. Deactivation may occur by the processor directing a driver or

other similar component to quit sending data signals from the memory unit to the inductor. Deactivation may also happen within a prescheduled period of time, whereupon stored data is compromised, i.e. erased.

[0041] However, a variety of other mechanisms to deactivate the inductor may be provided by the interface card. For example, the card may include switch that permits a user to manually deactivate the inductor. In another embodiment, the activation of the inductor is timed and is automatically deactivated after the time expires, e.g. 60 seconds to 600 seconds after activation occurs. In any case, where a second sensing area fails to deactivate the inductor, e.g. the second sensing area is not placed within a distance to detect the reader device or a faulty transfer of data occurs, a default deactivation mechanism may result in turning off the inductor and thereby reserving card power.

[0042] The second sensing area may be a portion of the inductor **10** or another component of the card that is separate from the inductor **10**, e.g. a sensing inductor. The second sensing area **20** may be located at or near a second end **22** of the data area **6**, which is the portion of the interface card that is last to be exposed to the reader device signals. For example, the interface card may be moved relative to the read head of the reader device, or vice versa, e.g. swiped, such that the second sensing area detects reader device signals when the transfer of data is complete. Usually the second end **22** is the opposite end of the data area and inductor from the first end **18**. In one embodiment, the second sensing area may be the last coil or final number of coils of the inductor. The second sensing area may also be a portion of a liquid suspension inductor that is end portion read by a reader device.

[0043] Thus, the inductor may have a first sensing area to signify the start of data transfer and a second sensing area to indicate the completion of the transfer. Alternatively, the inductor may only have the first sensing area or only have the second sensing area. In still another embodiment of interface card, a single sensing area of the inductor serves to detect the presence as well as the absence of electromagnetic signals from the reader device. The inductor is activated when the reader device signals are detected and deactivated when the reader device signals are removed. In this situation, the interface need not be moved from one sensing area to another sensing area in order to turn on and turn off the inductor. In any case, the sensing area permits the activation period for the inductor to be minimized and power on the interface card that is used for transferring data to be conserved.

[0044] In still another optional function of the inductor **10**, power may be induced into a power unit **36** of the interface card. The power unit **36** may be an energy storage area to hold power used to operate the interface card components, which may be integrated into the card, or able to be inserted into the card. For example, the power unit **36** may be a battery that is charged by the inductor transmitting energy from an external source to the power unit. In one method of the inductor supplying power, the inductor **10** is placed next to an external inductor in a power generator, such as in a battery charge unit. An inductively coupled field is formed and energy is transferred from the power generator to the card inductor **10**, where it is distributed to the interface card power unit **36**. In addition, rather than the inductor supplying any or all of the power for the interface card, the power unit may be also coupled to another power source. The power unit **36** may be a power connector to couple with an internal, attachable or external power source.

[0045] The data area **6** of the card may have one track of data having an inductor or several tracks for different purposes, each track having an inductor, such as 2 to 5 tracks, and often 2 to 3 tracks. The inductors of the tracks transfer various data that may be appropriate for particular transaction providers.

[0046] **Figure 2** shows one embodiment of a partial interface card **2** with two types of exemplary tracks **72, 74** in data area **70**. These are only one of many types of tracks and the data need not be presented in the order depicted, especially where the data is presented in a serial manner. Track one **72** may be standardized for the International Air Transport Association (IATA). Track one may sometimes be used by airline companies for securing reservations with a credit card, by credit card companies, etc. The recorded data includes a start sentinel **76**, such as "%" symbol, format code **78** and primary account number **80**, which may have a maximum number of digits, e.g. 19 digits. A name data **82** may have a maximum number of alphanumeric characters, e.g. 26 characters, which is separated from additional data **86** by a field separator **84**, such as "^" symbol. The additional data **86** may include other discretionary transaction data, such as expiration date, offset, encryption codes, etc. The track one **72** also includes an end sentinel **88**, such as "?" symbol and longitudinal redundancy check **90**. There are leading bits **92** and trailing bits **94** of multiple zeros.

[0047] Further to the example in **Figure 2**, track two **74** is standardized for the American Banking Association, such as a track used by ATM's, credit card checkers, etc. The data includes a start sentinel **76**, such as ";" symbol, primary account number **80**, which may have a maximum number of digits, e.g. 19 digits, a field separator **84**, such as "=" symbol, additional discretionary transaction data **86**, end sentinel **88**, such as "?" symbol

and longitudinal redundancy check **90**. There are leading bits **92** and trailing bits **94** of multiple zeros.

[0048] In addition, the interface card may include other types of tracks, such as a card-specific track for containing discretionary data that is not required by a transaction provider. For example, the card-specific track may contain fields for a card identifier, user statistics, number of times the card had been recorded with transaction data, Internet service provider information, etc. This card-specific data is usually not erased after a transaction. Another track may include a thrift track, which is similar to track one and track two in **Figure 2**. The track may also be updated, i.e. read and written to, during the transaction, by a reader device. Another track may be for Docutel's proprietary system. Other tracks and data may be included as required by various readers and transaction providers.

[0049] Often, the interface card is a blank interface card, which is void of user-specific data until the card interacts with the transport interface **102** of the personal data device **100**. At a time thereafter, one embodiment of interface card erases the user-specific data from the card and the card is ready to receive new user-specific data. The data area of the interface card connects with the personal program device to receive transaction data. Communication with the personal data device may be through a variety of mechanisms. For example, the card may be swiped through the personal data device or otherwise contacted with the data interface of the personal data device, the card placed proximal to the personal data device, etc.

[0050] In some embodiments, at least one visual indicator **38** is present in the interface card. The visual indicator is any optical display, such as a liquid crystal display (LCD),

light emitting diode (LED), and the like. The visual indicator may notify a user of the status of card operations. Usually, the visual indicator is simply a light that may be turned on or off. The processor may communicate with the visual indicator to direct the activation or deactivation of the visual indicator in response to an associated card operation. For example, an activated, e.g. lit, visual indicator may signify that a transfer of user-specific data is valid, i.e. accurate and complete, or that such as transfer is invalid, i.e. failed, incomplete, or with error.

[0051] In addition, the visual indicator may be employed to signify that a card is ready for data transfer, for example, that user-specific data has been programmed onto the card. The activation of one of a selection of visual indicators may mean that a particular type of user-specific data is carried in the card. The visual indicator may also denote that data has been erased from the interface card and/or that the card is blank, i.e. without user-specific data. In one instance, the visual indicator indicates that a user-specific data is present and has not been erased from the card, e.g. any automatic erasure has not been successful. In this case, a user may opt to manually delete the data by activating an erase control on the card. Furthermore, the visual indicator may be activated when the inductor is activated or deactivated to prompt a user to turn on or off the interface card.

[0052] Often, the visual indicator is employed with at least one indicium (not shown) disposed, e.g. printed, on a surface of the card. The indicium is often a mark, e.g. logo, trademark, image, photograph, etc. and/or word(s) that suggest the significance of a visual indicator. In one embodiment, a multiple indicia are present as a consolidated list, where each indicium represents a different transaction type. In this case, multiple visual indicators are also provided, at least one being paired with an indicium for a particular

transaction type. The number of indicia and/or visual indicators may vary depending on the potential uses for the card and limited by the space provided by the main body of the card, such as 2 to 50, and more usually, 2 to 10. For example, the various indicia may denote Visa®, Mastercard®, American Express®, etc., any of a number of mono-line card types, a particular bank debit type, a specific club membership, a discount coupon, an organization or company that tracks frequent point accumulations, an insurance company, telephone company, and many more transaction types that the card may be used to facilitate. However, such indicia and/or visual indicator are not necessary for the present interface card.

[0053] The interface device may include components in addition to those described herein. For example, one or multiple bus may be optionally provided to carry information between interface card components. In some variations of personal data device, particular components or all components may couple directly to each other or through a dedicated bus for the particular components, rather than connecting through a bus. In addition, a timer may be provided in the interface card to determine the timing for various card operations, e.g. period that the card stays turned-on, time to erase the user-specific data from the card, etc. Furthermore, the interface card may include components to process input signals, such as at least one amplifier, decoder and/or buffer.

[0054] **Figure 3** illustrates one example of a transaction environment **70** in which an interface card **2** may be employed by a user transaction system **60** to communicate with a transaction provider **20**. The user transaction system **60** has a personal data device **100**, an interface card **2**, and a server **62**. The transaction provider has components including a reader device **52** at the point of transaction **56** to read the data from interface card **2**, and

a processing center **58** to manage the transaction request. The transaction provider may include a credit card system, banking system, telephone service provider, health care provider, merchandise retailer, postal service, a variety of other parties that use transaction data for providing transactions, or combinations thereof.

[0055] The user-specific data that is subsequently read from the card may be transmitted through the various components of the transaction provider system **50**. Follow-up information may be sent to the various components of the user transaction system and/or transaction provider in response to the data exchange.

[0056] Although **Figure 3** demonstrates one layout of a transaction environment, the scope of the present invention anticipates that the user transaction system may communicate with any number of transaction provider systems having a variety of components arranged in various fashions with reference to the reader device. It is further intended that the user transaction system may include any number of servers, including no servers.

[0057] The user-specific data, including a data set or a selected portion from a data set, originates at a data source **72**. There are a wide variety of data sources that may supply the data. The data source may be a computer system that communicates with the personal data device, such as the server **62** or a card clearing house. A local storage device that is separate from the personal data device **100** may also serve as a data source such as a wireless phone, personal digital assistant (PDA), laptop, etc. The data source **72** may be a device dedicated for Internet access, such as an Internet appliance. In addition, the data source may be a removable storage module that is coupled to, e.g. insert into, the

personal data device **100**. For example, the data source may be a tape, CD, hard drive, disc or other removable storage medium.

[0058] In some embodiments, the data source is a device to relay audio data, such as a telephone, speaker, audio recorder, and the like, where the personal data device may also have voice recognition capabilities. Still in other embodiments, the data source is an input component of the personal data device, e.g. a keyboard, touch screen, cursor control (such as a mouse or trackball), audio receiver (such as a microphone), etc., where data is inputted directly from a user and into the personal data device.

[0059] Typically, the data source is portable or remotely accessible. However, static data sources are also possible, for example, where the personal data device or interface card receives data prior to being transported to the site of the intended transaction.

[0060] The personal data device **100** is any apparatus to pass data onto the interface card **2** for use as a conveyance medium to transfer to a reader device. The device is useful for storing a plurality of user-specific data associated with than one transaction type and usually numerous transaction types, such as 2 to 100 or more types. Often, the personal data device is wireless and/or portable convenience in transporting to the point of the transaction, i.e. an intelligent portable device, such as a wireless telephone (e.g. cellular, personal communications services (PCS), etc.), personal digital assistant (PDA), pager, wearable computer, or other wireless intelligent device. However a fixed device, i.e. not easily movable, is also possible. The device may be a computer system, which may be portable, such as a laptop, pocket computer, etc., or may be stationary, such as a desk top computer, e.g. a personal computer (PC), such as a Macintosh® (from Apple Corporation of Cupertino, California), Windows®-based PC (from Microsoft Corporation of

Redmond, Washington), or one of a wide variety of hardware platforms that runs the UNIX®, Sting or Linux® operating system or other operating systems. The devices listed are by way of example and are not intended to limit the choice of apparatuses that are or may become available in the data communications device field that may store and transmit data, as described herein.

[0061] Often, the personal data device has capabilities of performing functions not related to the transactions, i.e. extra-transactional tasks, such as non-transactional telephone use, storing and manipulating of general-purpose data, calendaring, receiving information across the Internet, notifying a user of a message, playing audio or video, capturing still images, video and/or audio, etc. In other embodiments, the personal data device is a dedicated device for application solely in the user transaction system according to the present invention.

[0062] As shown in **Figure 4**, the personal data device **100** includes a communication interface **104** to receive data from the data source, a storage unit **110** to hold the data, a transport interface **102** to pass the data onto the interface card for use by the transaction provider and a processor **106** to execute the various data manipulation tasks. Oftentimes, the personal data device also includes a power source **114** and/or a data presentation unit **112**.

[0063] The communication interface **104** is for receiving various data and transaction-related information from a local apparatus, an attached device or component that is internal to the personal data device, remote source, e.g. the server **62**. The communication interface **104** may also deliver data to another user device, for example, to synchronize current data with another computing device.

[0064] The personal data device may receive data through a variety of communication schemes. Such schemes include use of radio frequency, optical frequency or electrical wire transmissions from a communication source using any of the numerous communication standards used in the telecommunication industry. For example, communication may be through a network, e.g. an Internet connection, satellite transmission, Ethernet connection and other communication links for transferring the data to the personal data device **100**. A transmission may be made at frequencies appropriate for wireless communication schemes, e.g. infrared, etc.

[0065] Input of data from an external data source may be through a telephone request and responsive operator-assisted entry, e.g. by a telephone company, cut and paste from another computer application, transmission over a network, etc. Alternatively, the data may be directly inputted into the personal data device by a user, such as through a keyboard, keypad, audio receiver and configured with voice recognition software, etc.

[0066] The user-specific data that is selected relates to a particular intended transaction and is often chosen from a data set stored directly on the personal data device. In the alternative, the data may be selected from a data set on another storage system, such as a server, card clearing house system or local storage device, etc., and the selected data may be transferred to the personal data device.

[0067] The data may be selected to be passed to the interface card from a data set by a variety of mechanisms, e.g. a user command through a selection of variety of option menus, a user query, a user instruction for a particular user-specific data, automatically with the occurrence of an event, a scheduled time for a particular selection, under direction of another computer or device, or the like. Usually, data selection occurs at or

close to the time of the related transaction with the transaction provider. For example, data may be chosen when the user is at or proximal to the point of the transaction reader. In this manner, the card may be programmed by a personal data device "on-the-fly" when a user decides to immediately conduct a transaction.

[0068] The transport of user-specific data from the personal data device, or alternatively directly from the data source, to the interface card through a variety of communication links and/or networks, e.g. cellular, Internet, data nets, satellite nets, free-space optical networks, radio-frequency (RF), ultrasound transmissions and like transmission schemes that employ electromagnetic coupling. Where the data source directly transports user-specific data to the interface card, the personal data device may not be employed to transport data to the card. At other times, the personal data device directs the transport of data directly from the data source and onto the card.

[0069] Personal data device **100** also includes processor **106**, which may represent one or more processors to run an operating system and applications software that controls the operation of other device components. Some exemplary processors are a Motorola® Power PC processor, an Intel Pentium® (or x86) processor, etc. The processor **106** may also be a microprocessor. The processor may be configured to perform multitasking of several processes at the same time.

[0001] A bus **108** is usually provided to carry information between system components. The width of the bus determines how much data can be sent between components, such as 8-bit, 16 bit 32 bit, 64 bit (e.g. Peripheral Component Interconnect (PCI) bus), etc. However, in some variations of personal data device, particular components may couple

directly to each other or through a dedicated bus for the particular components, rather than connecting through bus **108**.

[0070] The storage unit **110** is provided to hold the user-specific data, possible option menus for display to the user through an optional presentation unit **112** such as a display (e.g. a liquid crystal display), and other transaction-related data. The storage unit **110** may be any magnetic, optical, magneto-optical, phonon, i.e. sound, tape, and/or other type of machine-readable medium or device for writing and storing data. For example, the storage unit **110** may be a writeable optical compact disc (e.g. CD ROM, DVD), a disc, tape, random access memory (RAM), such as dynamic RAM (DRAM) and static Ram (SRAM), etc. The amount of storage required depends on the type and amount of data stored. For example, a storage unit that is used to hold a single credit card data is about 2 Kbytes of memory and for storing 100 credit card data would have a non-volatile memory of at least 200 Kbytes.

[0071] In one embodiment, the personal data device **100** also has a temporary storage unit (not shown) to momentarily store the data prior to the storage unit **110** obtaining the data. In another embodiment, the storage unit **110** is the same as or similar to a memory unit for holding program application(s) for the personal data device, that may be one or a collection of various types of memory used.

[0072] Often a non-volatile storage, e.g. electrically erasable program read only memory (EEPROM), Flash memory, or cache, is provided for the operating system and resident software applications. The storage unit may also be a hard drive, either integrated within the system, or external and coupled to the system. The storage unit may also be coupled to other types of multiple storage areas that may be considered as part of the storage unit

or separate from the storage unit. These storage units **110** described are by way of example and are not intended to limit the choice of storage that are or may become available in the data storage field, as described herein.

[0073] In some embodiments, one or more option menus may be provided in the personal data device storage unit **110** to assist a user in selecting user-specific data for a transaction. Alternatively, the option menu may be stored on an external device and the selected user-specific data transferred to the personal data device. The option menu lists categories for a variety of different transaction for the consolidated store of a plurality of user-specific transaction data.

[0074] **Figures 5A** and **5B** illustrates one example of user-specific data option menus as may be stored in the storage unit **110** of the personal data device and presented to the user by presentation unit **112**. **Figure 5A** is an exemplary data set in the form of branching trees of the option menus, each having categories that lead to specific transaction data and **Figure 5B** is a selected data from the data set of **Figure 5A**. The data set **120** has an option menu **122**, having the data categories: finance, health and membership. Under a chosen finance category, a type menu **124** has data categories: cards, stock and bank. Further to a card category selection, a card menu **126** has categories: XYZ Retail and Visa. User-specific data list **228** has the account information for the card categories. Often, the option menus are presented to a user for category selection. However, the user-specific data list optionally may not be presented to a user where a category was selected in a preceding option menu. In this case, the personal data device associates the selected transaction type with appropriate user-specific data type, rather than having a user select a category from the user-specific data list. Each of the data tree branches may include

even further sub-menus and transaction data for the categories. The example shows Visa category as chosen from the data set. The specific transaction data for a chosen category of the data set is the selected user-specific data **130**, as depicted in **Figure 5B**.

[0075] The personal data device **100** also has a transport interface **102** that is in communication with an interface card **2**. The transport interface may provide the data to the interface card through a variety of mechanisms. For example, the transport may be through wireless means, such as such as optical, e.g. infrared radiation, radio frequency, audio frequency, and the like, that is emitted from the transport interface of the personal data device and intercepted by the data interface of the card. The transport interface may comprise an antenna, electromagnetic coupling device, such as antenna, transformer, magnetic induced field device, laser, or LED (e.g. for IR LED), electrical interface, such as a smart card writer, etc.

[0076] The personal data device **100** also includes a power source **114**, which may be an internal power supply, such as a battery, or a connection to an external power source. In one embodiment, the personal data device includes a single power supply to accommodate the transaction related functions as well as any extra-transaction operations of the personal data device. In the alternative, the personal data device may have separate power supplies for transaction function and other operations.

[0077] In addition, the personal data device may include various other optional components either related or unrelated to the storage and transfer of transaction data. The personal data device may comprise components for performing extra-transactional tasks, such as a transmitter for alternative communications with other devices, e.g. for connecting with a remote other telephone. In addition, there may also be components for

alerting a user of an event, such as an incoming message. The personal data device may further include an interrupt unit to disable and enable extra-transactional tasks, e.g. transmission functions, in coordination with loading data onto the reader device or interface card, where a card is employed.

[0078] In addition to the interface card and personal data device, another element that is often included in the user transaction system according to the present invention is a server **62**, which may communicate with a transaction provider, personal data device, and/or other user devices. The server **62** may receive transaction-related information from a transaction provider. The server **62** may also receive user-specific data or other information from the personal data device for storage in a database. The server usually retains transaction-related data, such as date of transaction, amount transacted, name of transaction party, type of transaction, service fees, interest charges, periodic statements, etc. in one or more database(s).

[0079] The server may analyze a transaction, reconcile the transaction and forward the results to the user. Furthermore, the server may provide follow-up information or other transaction-related information to the transaction provider or to the user, such as transmitting the information to the personal data device or other computer system. During the time of the transaction, the server may immediately provide such transaction or follow-up information to the personal data device "on the fly". For example, when a user wants to conduct a transaction, a user may request account information from the server and receive the answers by the personal data device. Immediately after the transaction, the user may receive on its personal data device confirmation of the transaction and the

current balance of the user's account or other personal information relating to and resulting from the transaction.

[0080] The transaction provider has various segments that may interact with each other and the user transaction system in providing the intended exchange, depending on the nature of the exchange and the transaction provider. A reader device **52** at the point of the transaction **56**, e.g. merchant terminal, reads the user's interface card. Such a reader device is any one of a wide variety of magnetic reader devices at the point of the transaction for retrieving user-specific data from a card, including general legacy equipment, hardware dedicated for sensing the interface card, or other future-developed reader devices. For example, the reader device is often a reader device for credit card information that is encoded in accordance with standards, such as the American National Standards Institute (ANSI), standard X4.16-1983 and international standard ISO/IEC 7811 Part 2.

[0081] The transaction provider may include a processing center **58** having various substations across a network that may be useful in processing a transaction such as a sponsoring banking institution, a central hub to manage the system, etc. The processing center may supply authorization for a transaction or pass a request for authorization to the server. The processing center may also interact with a card-issuing center that originated the interface card. The processing center may also provide transaction information, e.g. follow-up information, that is sent directly or via alternate services, to the personal data device or other user-defined location, e.g. e-mail account, personal server, such as an accounting department for a company, etc.

[0082] **Figures 6A** to **6C** are flow charts of methods **Figure 6A** shows one exemplary method of implementing the user transaction system to execute a transaction. The interface card receives data **200** from the personal data device, through any of a variety of possible mechanisms, *inter alia*, on the nature of the personal data device.

[0083] The personal data device passes the data to the card **202** when requested by a user, when the personal data device detects contact with or presence of an external interface card, or other such triggering events. Transporting of user-specific data to the interface card may be through a variety of procedures. The card and personal data device may be moved relative to each other by biomechanical operations, electro-mechanical processes, mechanical maneuvering, gravitational forces, etc. The transfer may require contact between a surface of the card and the personal data device or may take place without contact, e.g. placed at a proximal distance to each other, and through emitting various energy forms in the electro-magnetic spectrum, e.g. radiation, light, radio frequency, as well as other transmitting forms, e.g. sound waves, etc.

[0084] In a particular embodiment of a method for a personal data device to write data onto a card as depicted in the flow chart in **Figure 6B**, the device receives a user-data for various transaction types **220**, stores the data in one or more database, and associates the data with its corresponding transaction type. The personal data device also stores one or more option menus with entries that correspond to the available transaction types. These menus are presented to a user **222**, e.g. through a display, usually in response to a user command to select transaction data. A particular category in the option menus is chosen which is associated with user-specific data **224**. If the chosen category does not have associated data stored, the user in notified. The user may make another selection or input

the associated user-specific data. The selected user-specific data that is associated with the chosen category is located and retrieved from storage **226**. The selected data is written onto an interface card **228** according to the methods described above regarding the data interface.

[0085] In one embodiment, data transfer is accompanied by a prior or simultaneous and temporary disabling of extra-transaction activities of the personal data device. For example, the personal data device may include a transmitter for communicating to a remote source, such as a telephone transmitter. This disabling permits the personal data device resources to be directed to the programming of the interface card. The data transfer may optionally be capable of being aborted if the transmitter becomes enabled during the course of the data loading process. For example, if a user accepts a telephone call, the data transfer may be interrupted if the process had not completed prior to the device transmitter connecting the call.

[0086] Returning to **Figure 6A**, the user then presents the interface card to the reader device, which retrieves the selected data from the interface card **204**. Usually, the presenting of the interface card includes placing the inductor of the data area within a proximal distance from the reader device to allow the inductor, e.g. the first sensing area, to detect the electromagnetic signals emitted from the reader device. The appropriate distance depends, *inter alia*, on the power of the inductor, the strength of the reader device signals, the sensitivity of the card sensing circuits, the presence of any interfering medium, etc. For example, the distance may be between about 0.1 to 3.0 mm, and more often about 0.1 to 1.0 mm. It is usually not necessary for the interface card to contact the

surface of the reader device in order for the inductor to sense the presence of the reader device. Thus, the inductor need not become worn by repeated surface contacts.

[0087] One method of presenting the interface card to a reader device wherein the inductor automatically detects electromagnetic signals of the reader device is depicted by the flow chart in **Figure 6C**. The inductor of the card and an inductor of the reading head of the reader device are introduced to each other **340**. The first sensing area of the inductor detects signals from the reading device **342** and sends a signal to the processor to notify that the inductor has been introduced to the reading head **344**. In response, the interface card prepares to transfer the data to the reader device. The card inductor is then activated to transfer the user-specific data to the reader device **346**. In some embodiments, there are multiple inductors for transferring data, such as an inductor in each of multiple tracks. In this case, all inductors required for a particular transaction type are activated in a concurrent or serial manner.

[0088] Each inductor transfers the data **348**. The transfer of user-specific data to the reader device from the interface card is by electromagnetic coupling. After transfer ends, the card is withdrawn from the reader device, e.g. taken out of a slot on the reader head, pulled away from proximity to the reader device, etc.

[0089] Usually during the data transfer, the card is moved relative to the reader device from the first sensing area to a second sensing area of the inductor and the second area detects the reader device signals **350**. Upon detecting the signals, the second sensing area sends notification signals to the processor **352**. The processor recognizes this notification as the end of the data transfer. The inductor is then deactivated **354** and stops the data

transfer **356**. In other embodiments, the inductor is deactivated after an established period of time, as tracked by a timer on the card.

[0090] In one type of method according to the present invention, the reader device or other terminal at the point of transfer requests authorization for the transaction from any substation included in the processing center or from the server. The authorization may be registered at the server, a card clearing-house system, or specific other authorization system. Authorization may be with an authorization code or server code authorization program utility.

[0091] The processing center may receive a request for authorization and respond or route it to the server. The processing center may also include various transaction substations that may receive the request and either respond or route the request to the appropriate other substation.

[0092] If the server receives the request, it references stored user data such as cumulative transaction financial limitations, merchant discrimination criteria, card load balancing or transfer solutions, etc. Upon receiving the request for authorization, the server may also reference transaction related information, such as merchant discounts; comparative pricing analysis; transaction provider specific details, such as insurance, incentives, cumulative merchant purchase-related discounts, rebates, cash, etc; interest rate loyalty reductions or other incentives; etc. The server may send this information to the personal data device or to the processing center, which may also route the transaction related data to a terminal at the point of transaction.

[0093] The data may be conveniently erased from the interface card **206** at any time after transporting of data onto the card and usually after the transaction and the card is withdrawn from the reader device. Erasing permits the data area to receive future data.

[0094] In one embodiment, the memory unit is erased of data by disengaging the memory power unit from the memory unit or exhausting the memory power unit of power, thus depleting the memory of power to operate. Usually, data is erased, such as by clearing the memory unit which may be automatically triggered by the second sensing area detecting the reader device signals, representing the end of data transfer. The processor receives the notification from the second sensing area and controls the memory power unit to erase the memory or other components that effectuate the erasing of data. The erasing may occur immediately after the second sensing area detects the reader device or within a prescribed time thereafter. For example, the erasing may be scheduled to be erase between 5 seconds or 1 year, and usually 1 minute to 60 minutes, and more typically 1 minute to 5 minutes, after the second sensing area detects the reader device.

[0095] The memory power unit may also be exhausted or disengaged by the control of the personal data device. A user may place the card proximal to the personal data device, contact the surfaces or swipe the surfaces in order to erase the data. The personal data device may also include an erase control for the user to activate the erase components of the personal data device. The erase control may be an option in a menu, a button, screen pad voice command recognition, or other input device. However, a variety of triggering events may also initiate the invalidation of data. For example, the sending or receiving of follow-up information; a signal that the transaction is complete; authorization-dependent

variables, such as authorization time period validity; user-defined personal profile, such as cumulative transaction financial limitation reached; or other events.

[0096] Furthermore, the erasure may occur automatically by various other mechanisms. For example, erasure may be due to loss of a primary power supply for the card, transmitting new data to the transaction card, thereby causing previous data on the card to be lost, etc.

[0097] The transaction system may optionally provide follow-up information to the user, the transaction provider or a designated third party **208**. The user may select a receiving device to accept the follow-up information. For example, the follow-up information may be sent to a corporate system to track expenses made by an employee user to a personal computer of the user, or to the personal data device. This follow-up information may be sent by a server immediately after a transaction is complete, i.e. real time, by or at any designated point during or after the transaction. In one embodiment, the follow-up information is automatically routed to a transaction provider system for acceptance or to the user's wireless device or computer via e-mail, HTML "rich" message, application specific attachment, such as spreadsheet or finance software, e.g. Quicken, from the card service, card clearing house, or server. In one application, the follow-up information is sent to a designated web site to be reviewed with authorized access.

[0098] The follow-up information may be a confirmation of a completed transaction, a balance update, notice of required subsequent tasks by the user, advertisements, etc. In one embodiment, the follow-up information may be any useful information that may send the follow-up information directly to an accounting department to track expenses. The

data may be in any convenient format. In one embodiment, the data is formatted to be directly loaded into an application-specific program, such as Excel, Quicken, etc.

[0099] After all steps are performed, the method may end **210**, continue to perform other functions or repeat the process starting at any of the preceding steps. Although **Figures 6A** to **6C** show various methods of employing the user transaction system, the order of sequence for the steps may be performed in other reasonable orders. For example, the transaction system may send follow-up data prior to erasing the card data, rather than after the removal of data. Also, the written data may be erased prior to the recorder device retrieving the data and the process ends, as where a user decides to abort the transaction.

[00100] Furthermore, optional steps may be added to the procedure. For instance, security mechanisms may be provided for the transaction system. A single transaction authorization security protocol may be included in the personal data device permitting the selected user-specific data loaded on a conveyance medium, e.g. card, to be valid for use in only one transaction. Thereafter, new user-specific data must be loaded onto the card from the personal data device for another transaction. In addition, the transaction system may employ encryption protocols in the personal data device to encrypt the data, server encryption protocols, personal identity number (PIN) or other password protections, etc. In another optional step, the user-specific data may be deleted from the reader device, for example, the reader device erases the transferred data after the transaction is complete.

[00101] In alternative embodiments of a user transaction system, the personal data device includes an internal interface card component having a recording medium in a format that is accessible to a reader device. The interface card serves in the same

capacity and has the same attributes as the external interface card described above. In one example, an interface card component may be detachable from the personal data device for use by a reader device and may be reattached after the transaction is completed. The card component may be situated in a compartment of the personal data device, i.e. neutral position, and separated by sliding out, popping out, being pulled from the data device, or other such detaching mechanisms. In another configuration, the card component may remain connected to the personal data device and extend from the compartment in the personal data device as needed for a reader device to access the recorded data therein.

[00102] In addition, various software components, e.g. applications programs, may be provided within or in communication with the personal data device, that cause the processor or other components to execute the numerous methods employed for storing and transferring data. The software may be provided in a machine-readable medium storing executable code and/or other data to provide one or a combination of mechanisms to process user-specific data, according to one embodiment of the invention. The machine-readable storage medium represents one or a combination of various types of media/devices for storing machine-readable data, which may include machine-executable code or routines. As such, the machine-readable storage medium could include, but is not limited to one or a combination of a magnetic storage space, magneto-optical storage, tape, optical storage, dynamic random access memory, static RAM, flash memory, etc. Various subroutines may also be provided. These subroutines may be parts of main routines or added as plug-ins or Active X controls.

[00103] The machine-readable medium may include routines and subroutines for the methods of the interface card receiving user-specific data, storing the data, sensing a reader device, activating an inductor, transferring user-specific data to a reader device, sensing withdraw from the reader device, deactivating an inductor and/or erasing user-specific data, as describe above. In addition, other software components may be included, such as an operating system.

[00104] The software components may be provided in as a series of computer readable instructions that may be embodied as data signals in a carrier wave. When the instructions are executed, they cause a processor to perform the data storage and transfer steps as described. For example, the instructions may cause a processor to receive and store data, to detect a card and load data onto the card. Such instructions may be presented to the processor by various mechanisms, such as a plug-in, ActiveX control, through use of an applications service provided or a network, etc.

[00105] The present invention has been described above in varied detail by reference to particular embodiments and figures. However, these specifics should not be construed as limitations on the scope of the invention, but merely as illustrations of some of the presently preferred embodiments. It is to be further understood that other modifications or substitutions may be made to the described user transaction system as well as methods of its use without departing from the broad scope of the invention. Therefore, the following claims and their legal equivalents should determine the scope of the invention.